FIG. 1
PRIOR ART

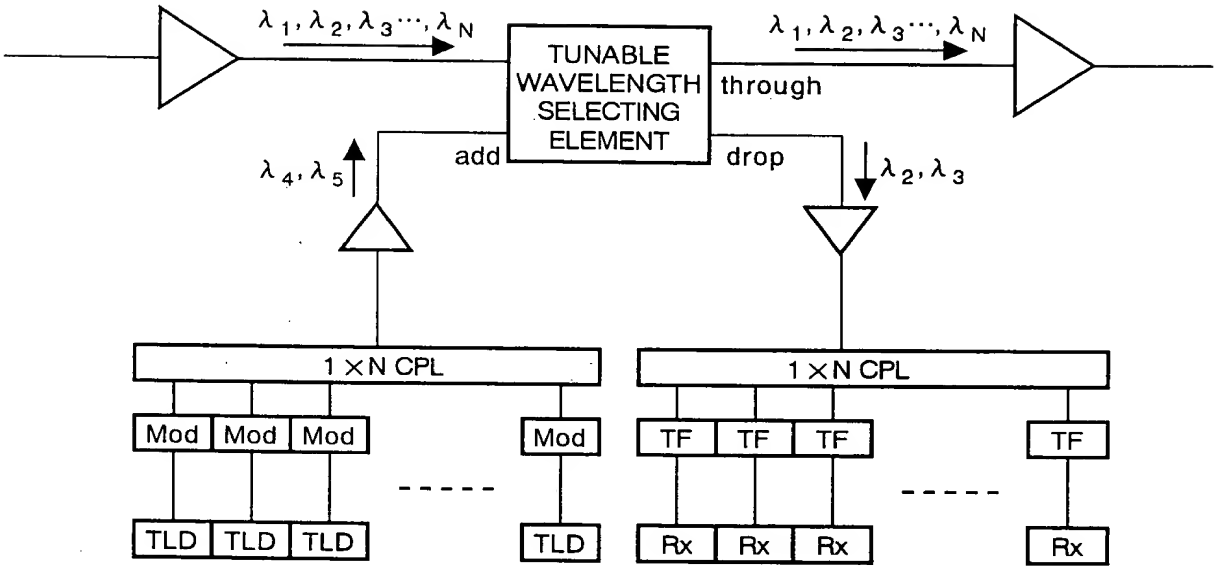


FIG. 2

PRIOR ART

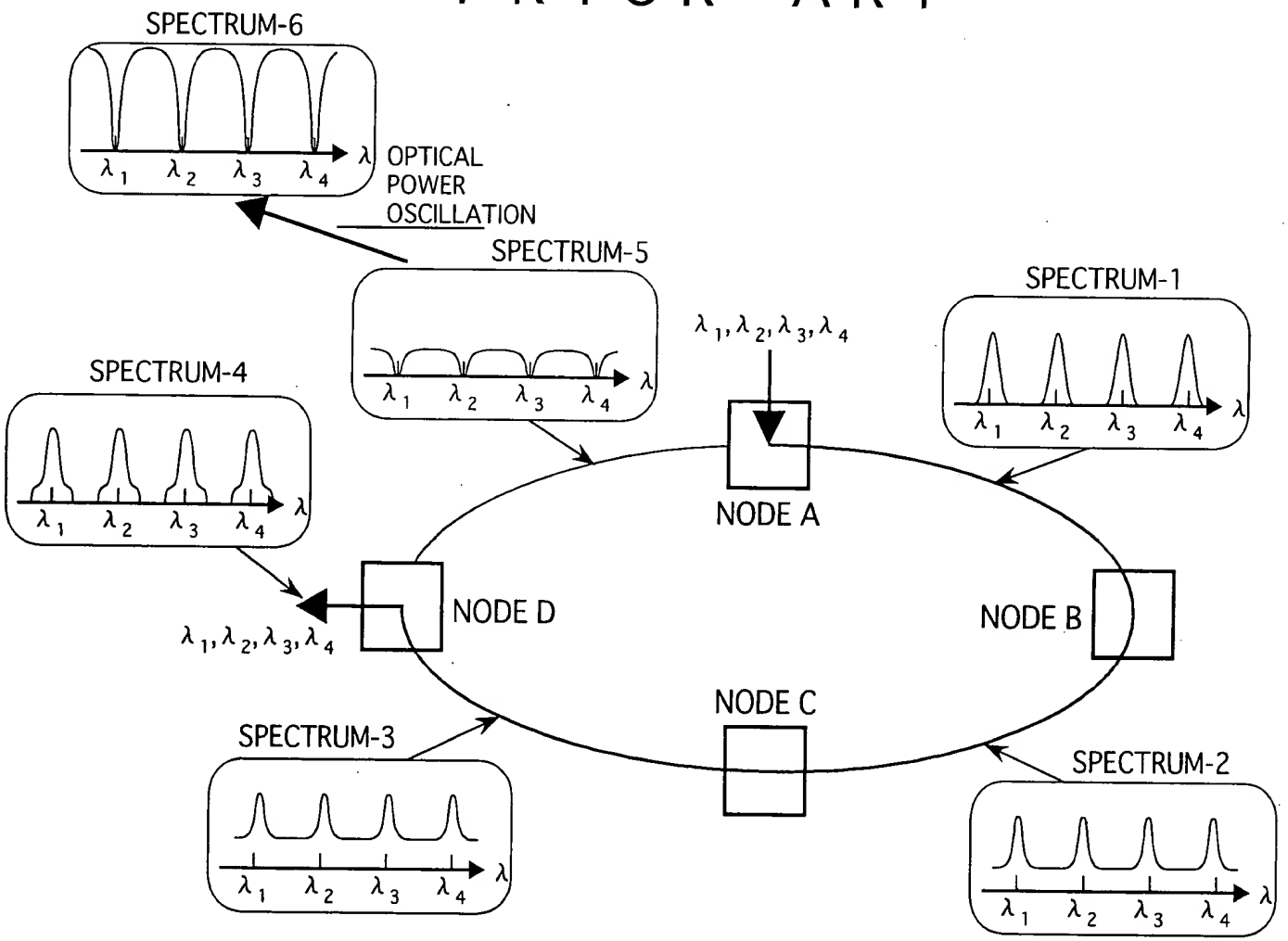


FIG. 3

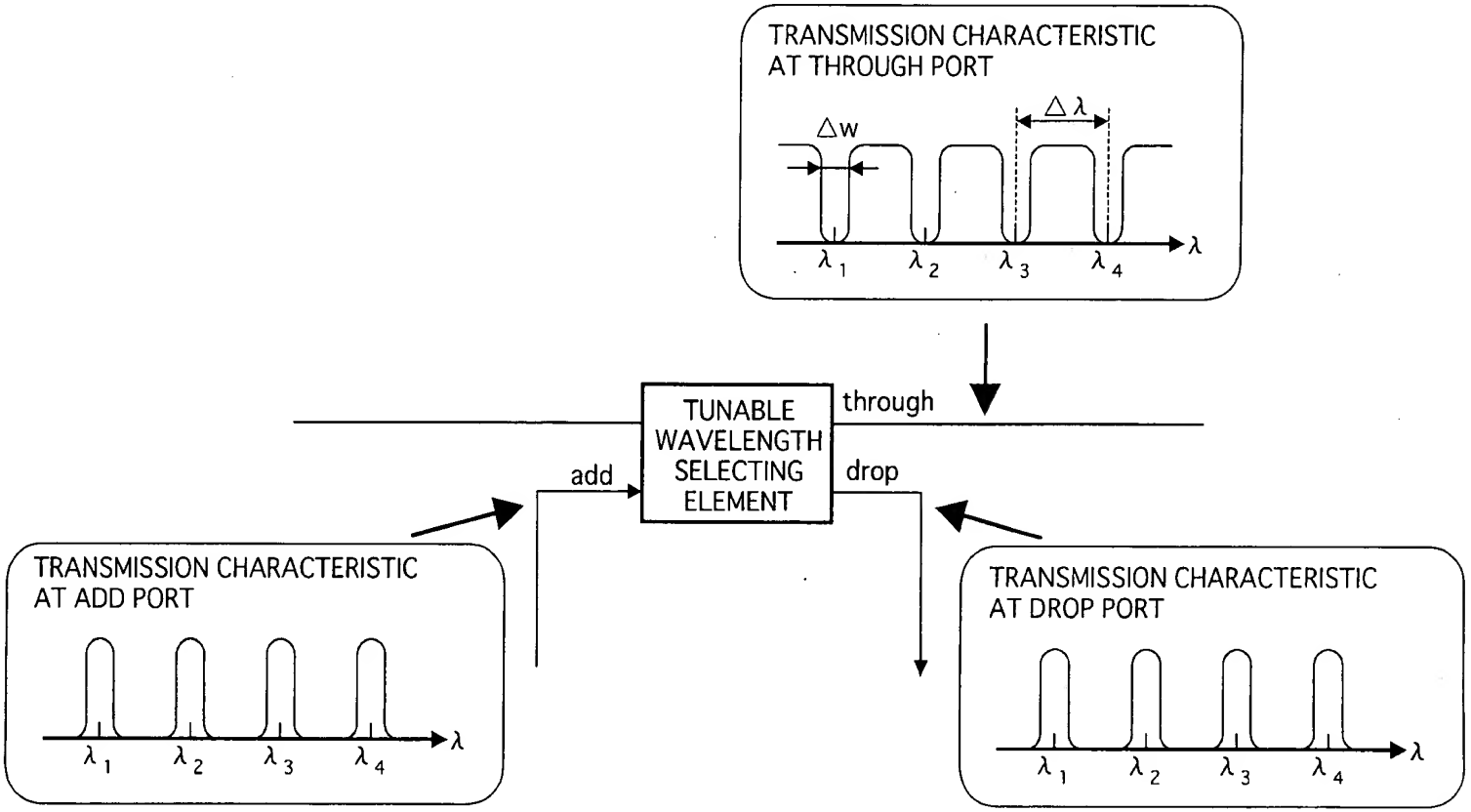

TRANSMISSION CHARACTERISTIC AT THROUGH PORT
Δw
Δλ
λ1
λ2
λ3
λ4
λ
through
add
drop
TUNABLE WAVELENGTH SELECTING ELEMENT
TRANSMISSION CHARACTERISTIC AT ADD PORT
TRANSMISSION CHARACTERISTIC AT DROP PORT

FIG. 4

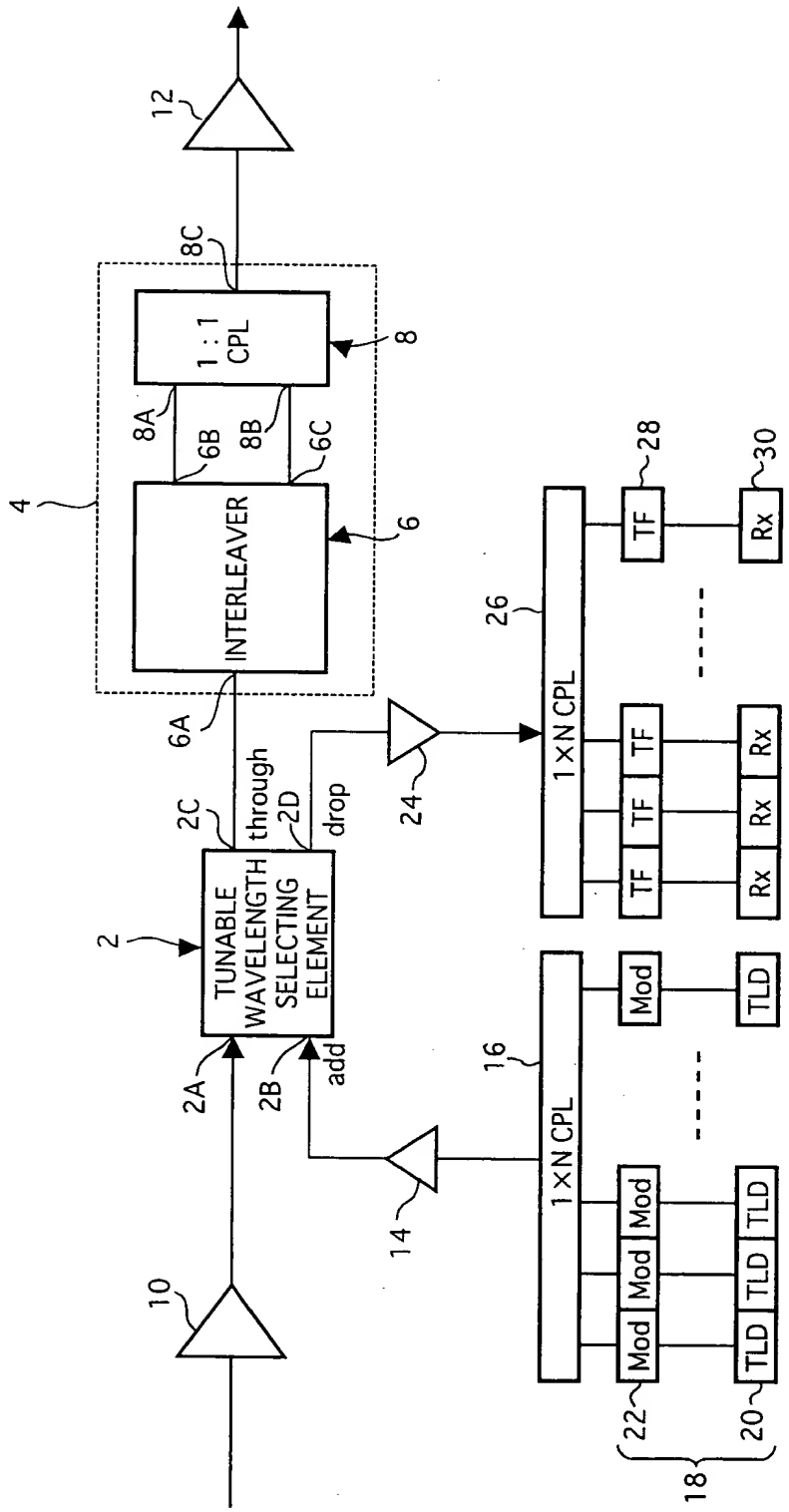

12
8C
1 : 1 CPL
8
8A
6B
8B
6C
4
INTERLEAVER
6
6A
2C
through
2D
drop
2
TUNABLE WAVELENGTH SELECTING ELEMENT
2A
2B
add
10
14
24
26
1×N CPL
16
1×N CPL
28
TF
30
Rx
Mod
TLD
22
20
18

FIG. 5A

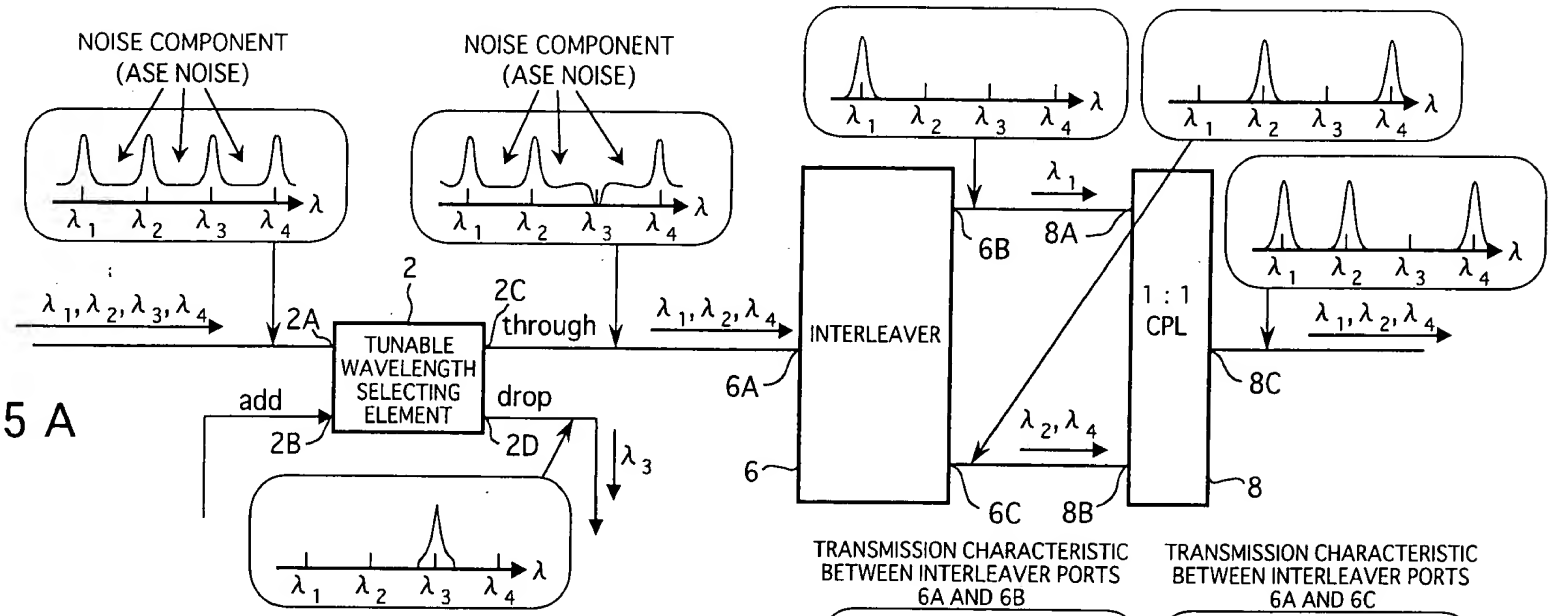

NOISE COMPONENT
(ASE NOISE)
NOISE COMPONENT
(ASE NOISE)
λ1 λ2 λ3 λ4 λ
λ1, λ2, λ3, λ4
2
2A
2C
through
TUNABLE WAVELENGTH SELECTING ELEMENT
add
2B
drop
2D
λ3
λ1, λ2, λ4
INTERLEAVER
6
6A
6B
6C
λ1
8A
λ2, λ4
1 : 1 CPL
8
8B
8C

FIG. 5B

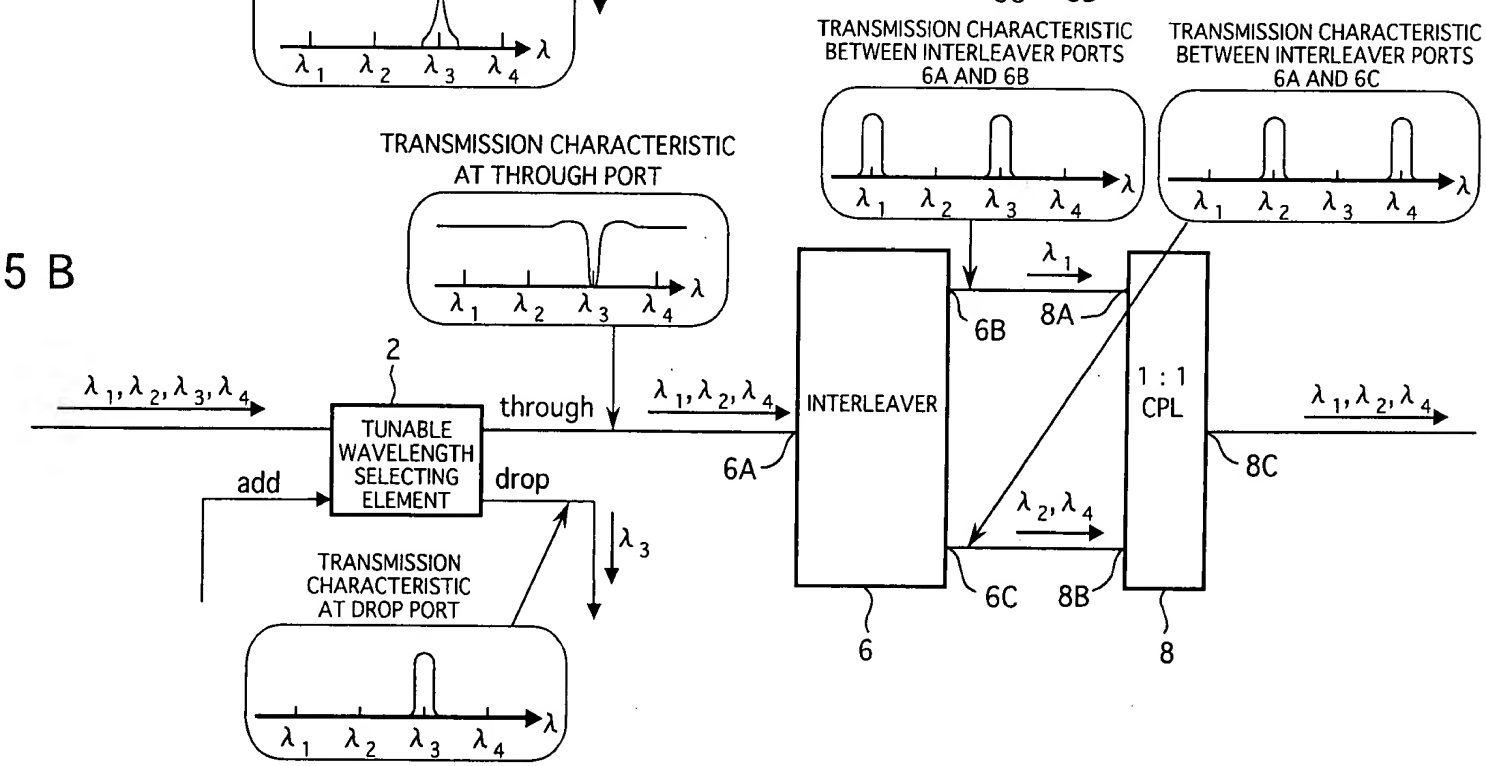

TRANSMISSION CHARACTERISTIC BETWEEN INTERLEAVER PORTS 6A AND 6B
TRANSMISSION CHARACTERISTIC BETWEEN INTERLEAVER PORTS 6A AND 6C
TRANSMISSION CHARACTERISTIC AT THROUGH PORT
λ1 λ2 λ3 λ4 λ
λ1, λ2, λ3, λ4
2
through
TUNABLE WAVELENGTH SELECTING ELEMENT
add
drop
λ3
TRANSMISSION CHARACTERISTIC AT DROP PORT
λ1, λ2, λ4
INTERLEAVER
6
6A
6B
6C
λ1
8A
λ2, λ4
1 : 1 CPL
8
8B
8C

FIG. 6

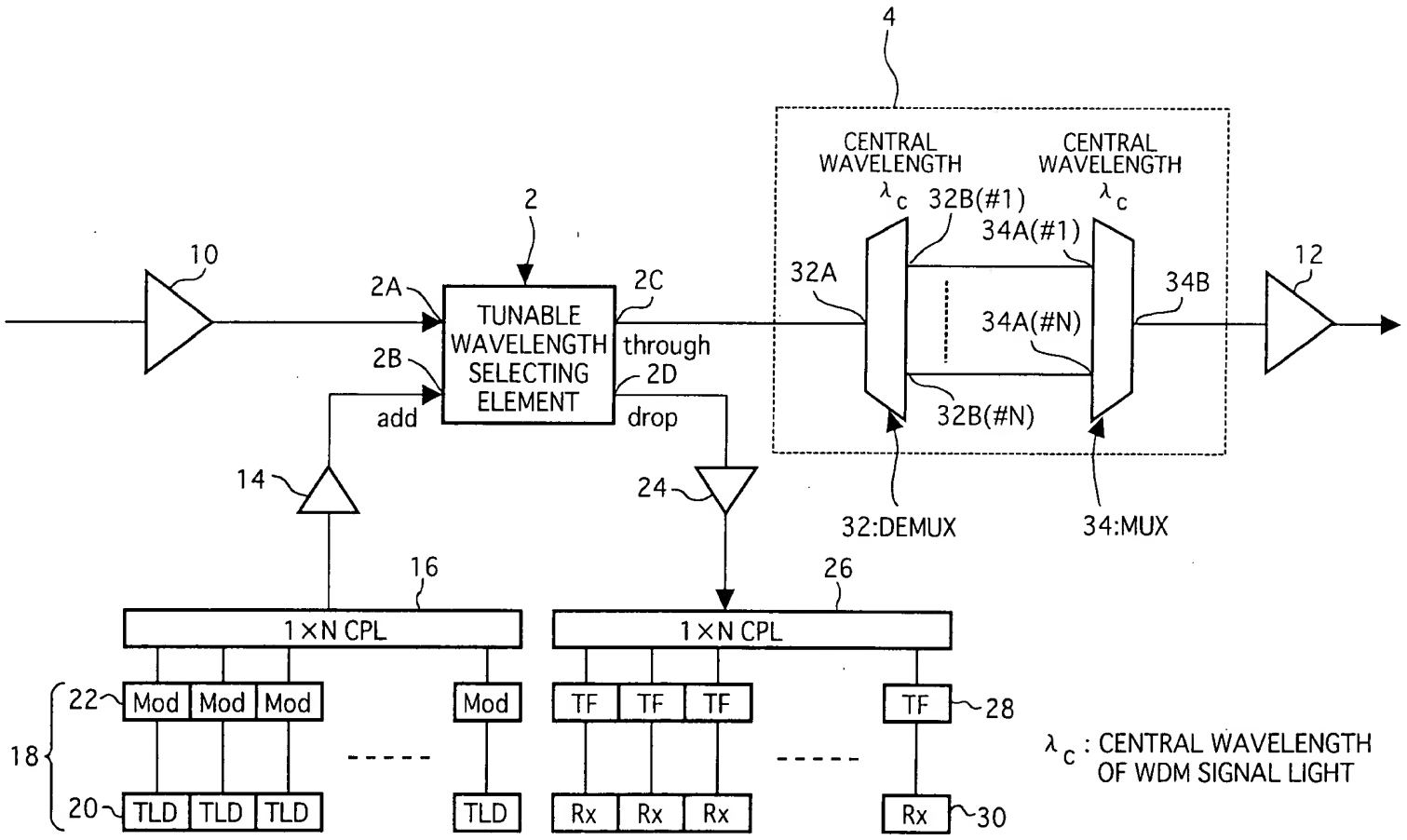
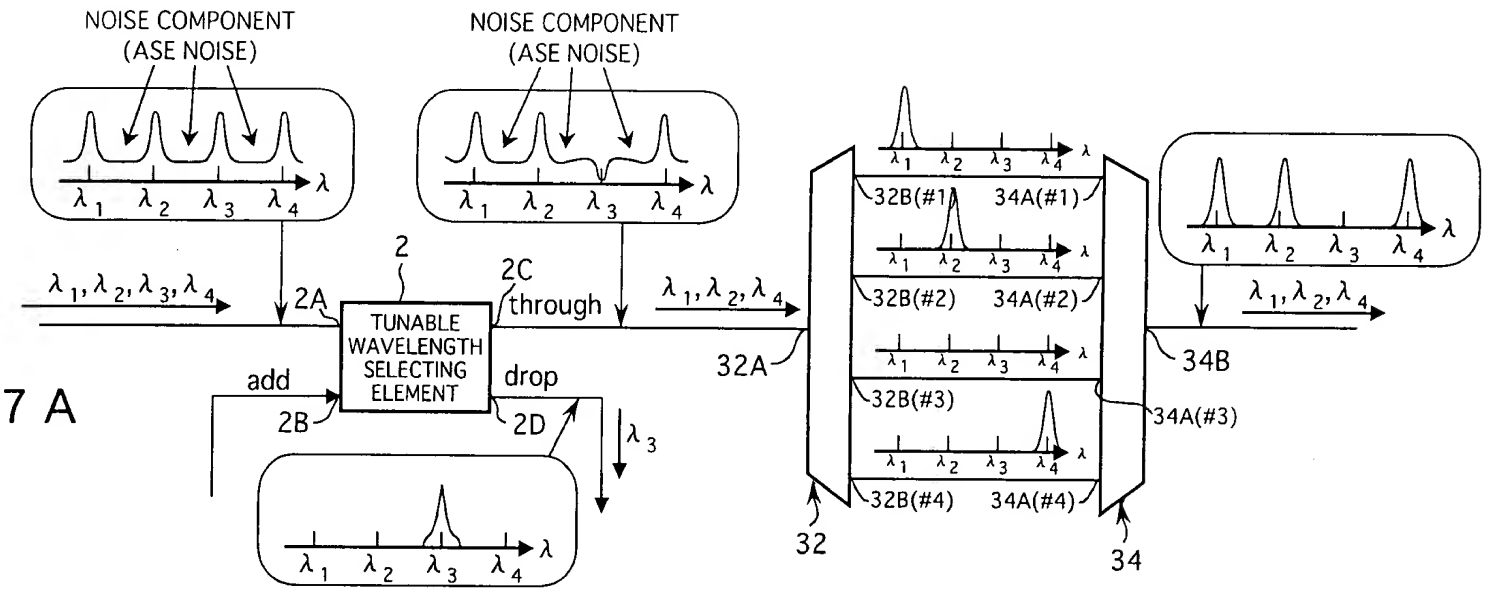
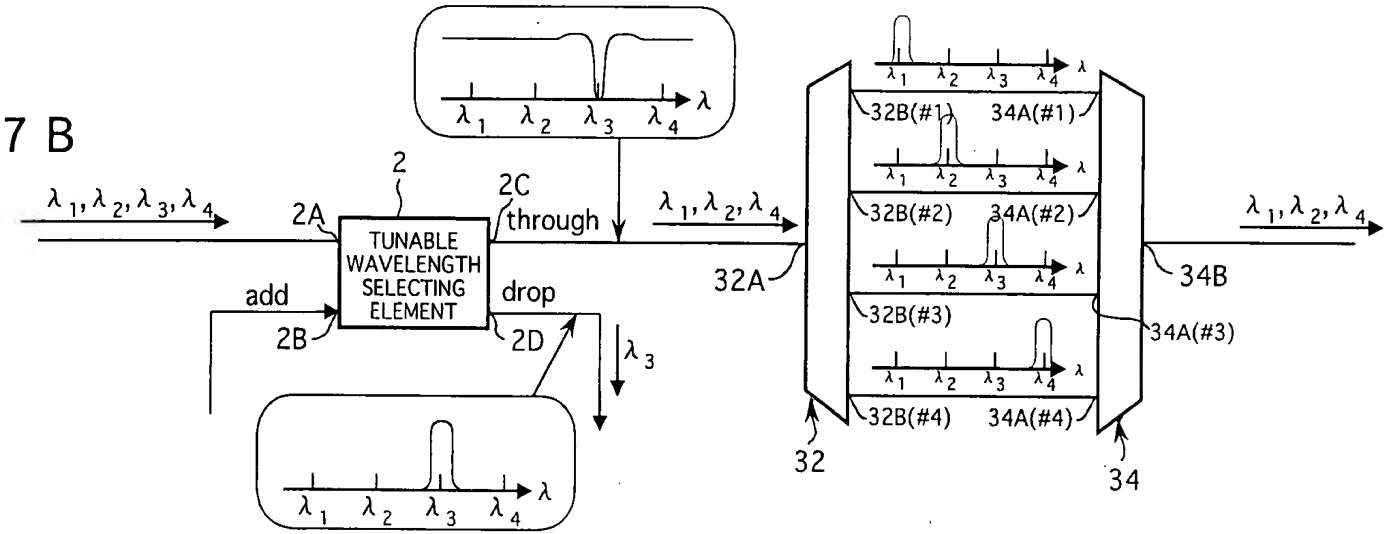

4
CENTRAL WAVELENGTH λc
CENTRAL WAVELENGTH λc
32B(#1)
34A(#1)
34A(#N)
32B(#N)
32A
34B
12
10
2
2A
2C
TUNABLE WAVELENGTH SELECTING ELEMENT
through
2D
2B
add
drop
14
24
32:DEMUX
34:MUX
16
26
1×N CPL
1×N CPL
22
Mod
Mod
Mod
Mod
18
20
TLD
TLD
TLD
TLD
TF
TF
TF
TF
28
Rx
Rx
Rx
Rx
30
λc : CENTRAL WAVELENGTH OF WDM SIGNAL LIGHT

FIG. 7A



TRANSMISSION CHARACTERISTIC AT THROUGH PORT

FIG. 7B



TRANSMISSION CHARACTERISTIC AT DROP PORT

F I G. 8

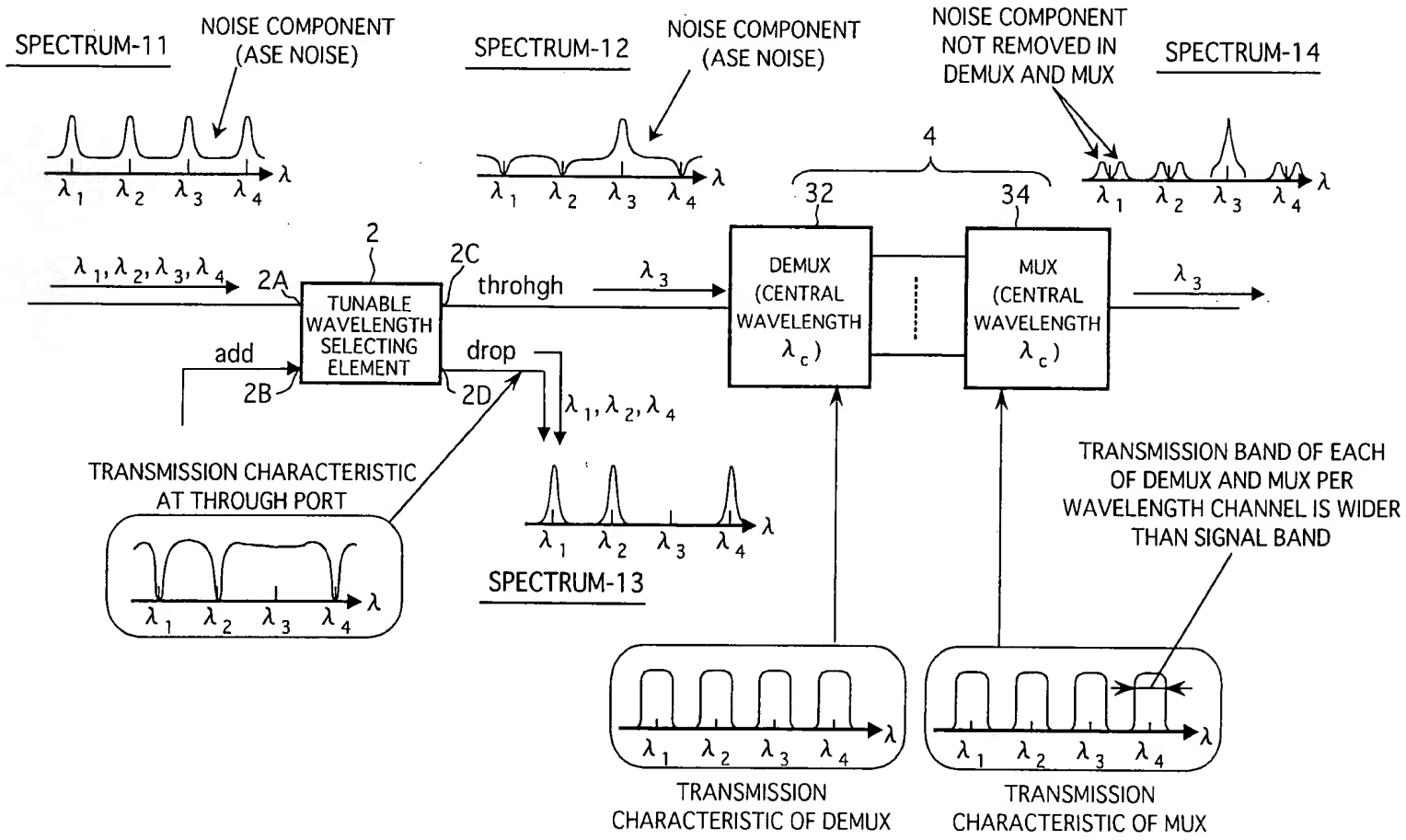

SPECTRUM-11
NOISE COMPONENT (ASE NOISE)
SPECTRUM-12
NOISE COMPONENT (ASE NOISE)
NOISE COMPONENT NOT REMOVED IN DEMUX AND MUX
SPECTRUM-14
4
32
34
2
2C
2A
TUNABLE WAVELENGTH SELECTING ELEMENT
throhgh
DEMUX (CENTRAL WAVELENGTH λc)
MUX (CENTRAL WAVELENGTH λc)
add
2B
drop
2D
TRANSMISSION CHARACTERISTIC AT THROUGH PORT
SPECTRUM-13
TRANSMISSION BAND OF EACH OF DEMUX AND MUX PER WAVELENGTH CHANNEL IS WIDER THAN SIGNAL BAND
TRANSMISSION CHARACTERISTIC OF DEMUX
TRANSMISSION CHARACTERISTIC OF MUX

FIG. 9

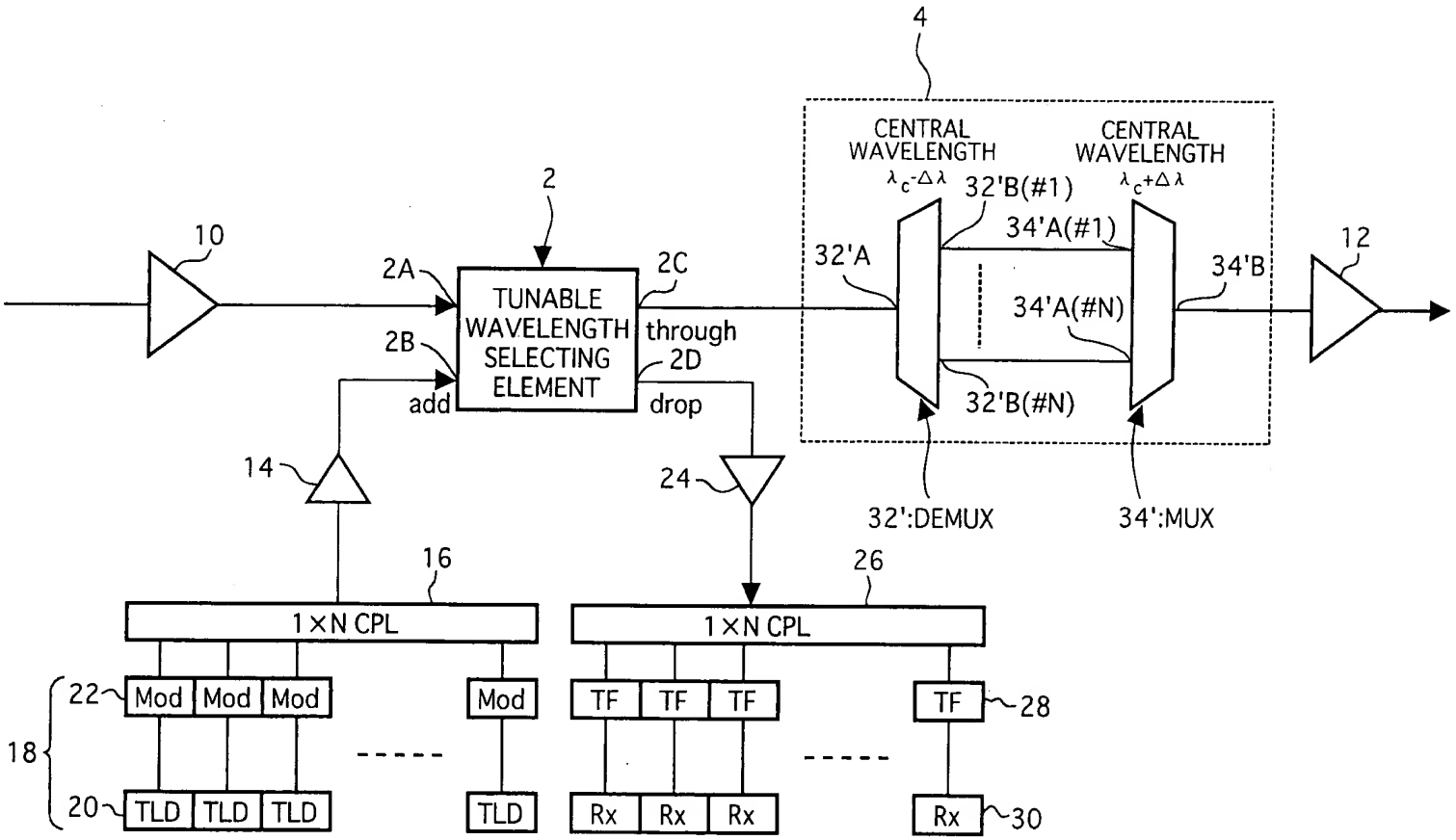

4
CENTRAL WAVELENGTH
$\lambda_c-\Delta\lambda$
CENTRAL WAVELENGTH
$\lambda_c+\Delta\lambda$
32'B(#1)
34'A(#1)
32'A
34'B
12
10
2
2A
2C
TUNABLE WAVELENGTH SELECTING ELEMENT
through
2B
2D
add
drop
34'A(#N)
32'B(#N)
14
24
32':DEMUX
34':MUX
16
26
1×N CPL
1×N CPL
22
Mod
Mod
Mod
Mod
TF
TF
TF
TF
28
18
20
TLD
TLD
TLD
TLD
Rx
Rx
Rx
Rx
30

FIG. 10

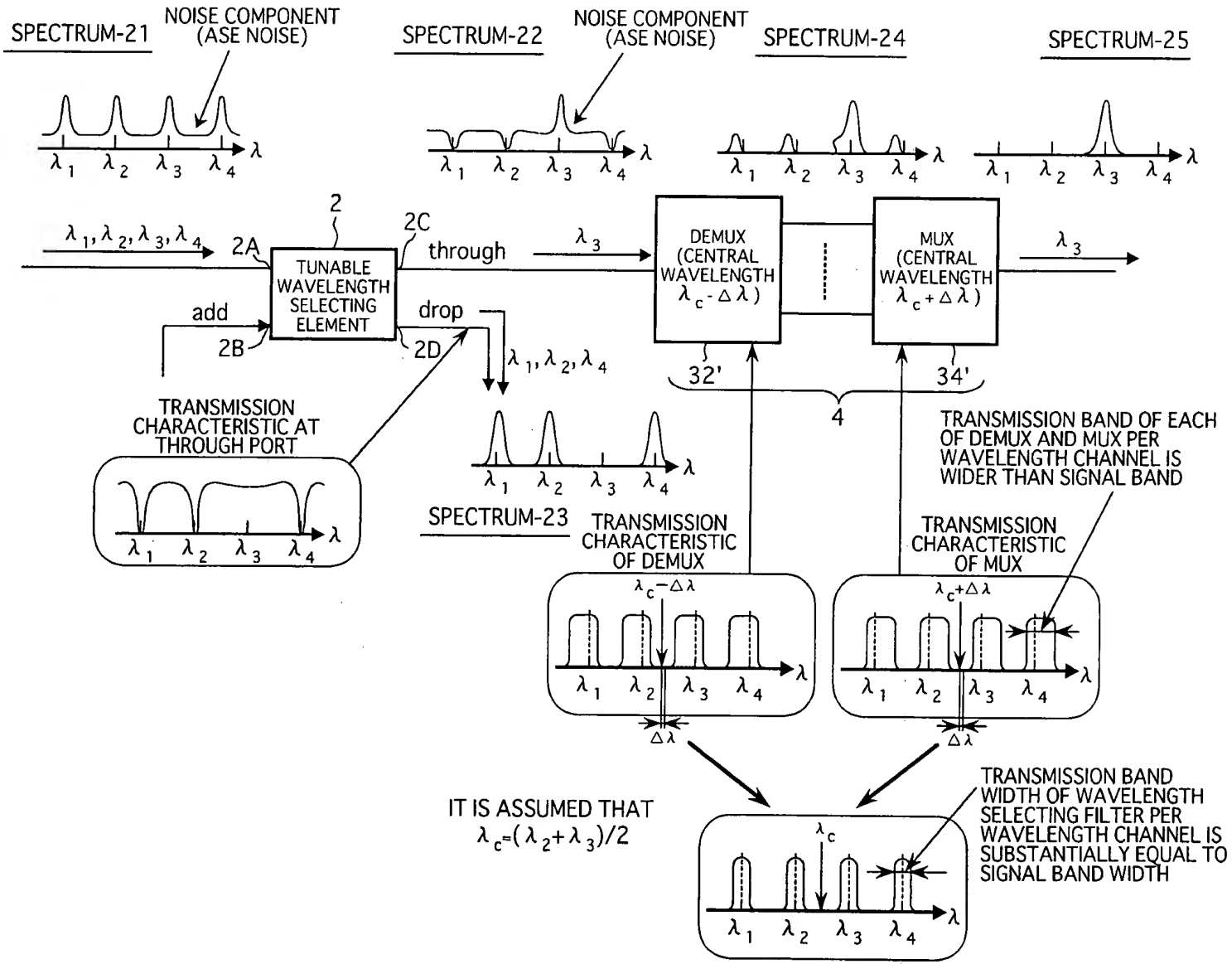

SPECTRUM-21
NOISE COMPONENT (ASE NOISE)
SPECTRUM-22
NOISE COMPONENT (ASE NOISE)
SPECTRUM-24
SPECTRUM-25
λ1 λ2 λ3 λ4 λ
2
2A
2B
2C
2D
TUNABLE WAVELENGTH SELECTING ELEMENT
add
drop
through
λ1,λ2,λ3,λ4
λ3
DEMUX (CENTRAL WAVELENGTH λc-Δλ)
MUX (CENTRAL WAVELENGTH λc+Δλ)
32'
34'
4
TRANSMISSION CHARACTERISTIC AT THROUGH PORT
SPECTRUM-23
TRANSMISSION CHARACTERISTIC OF DEMUX
TRANSMISSION CHARACTERISTIC OF MUX
TRANSMISSION BAND OF EACH OF DEMUX AND MUX PER WAVELENGTH CHANNEL IS WIDER THAN SIGNAL BAND
λc−Δλ
λc+Δλ
Δλ
IT IS ASSUMED THAT λc=(λ2+λ3)/2
λc
TRANSMISSION BAND WIDTH OF WAVELENGTH SELECTING FILTER PER WAVELENGTH CHANNEL IS SUBSTANTIALLY EQUAL TO SIGNAL BAND WIDTH

FIG. 11

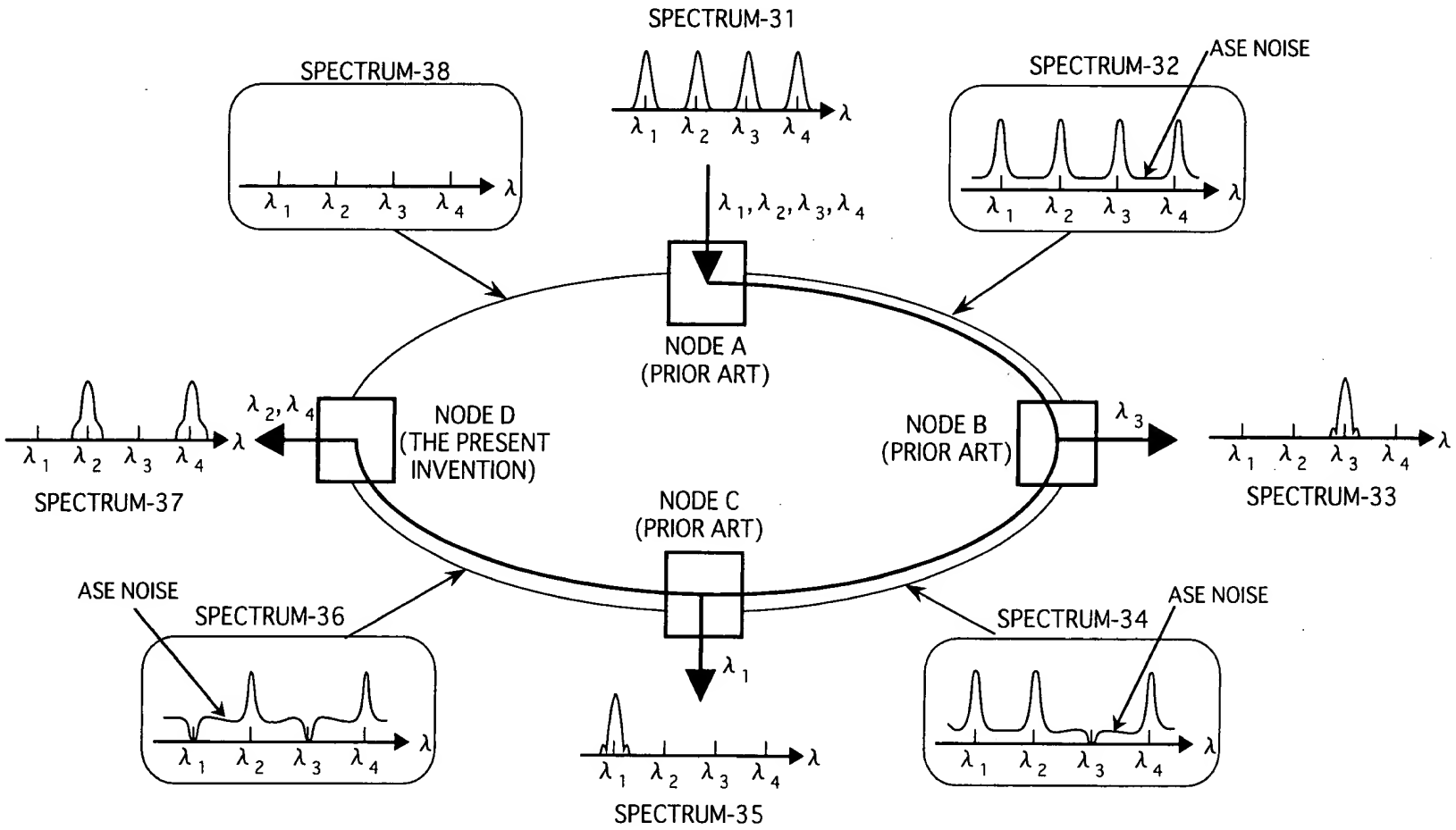

SPECTRUM-31
SPECTRUM-38
SPECTRUM-32
ASE NOISE
λ1 λ2 λ3 λ4 λ
λ1, λ2, λ3, λ4
NODE A
(PRIOR ART)
λ2, λ4
NODE D
(THE PRESENT
INVENTION)
NODE B
(PRIOR ART)
λ3
SPECTRUM-37
SPECTRUM-33
NODE C
(PRIOR ART)
ASE NOISE
SPECTRUM-36
SPECTRUM-34
ASE NOISE
λ1
SPECTRUM-35

FIG. 12

PRIOR ART

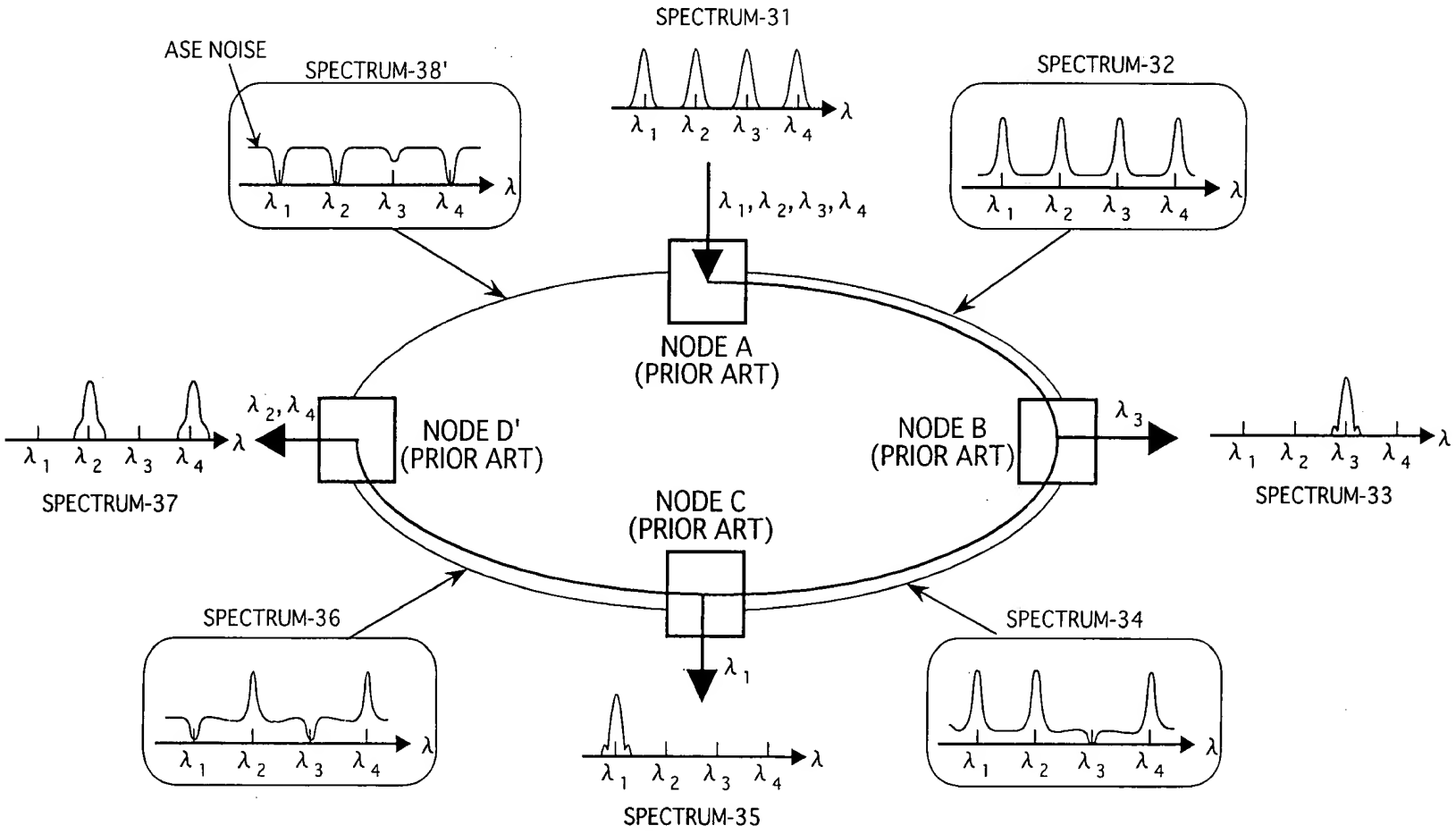
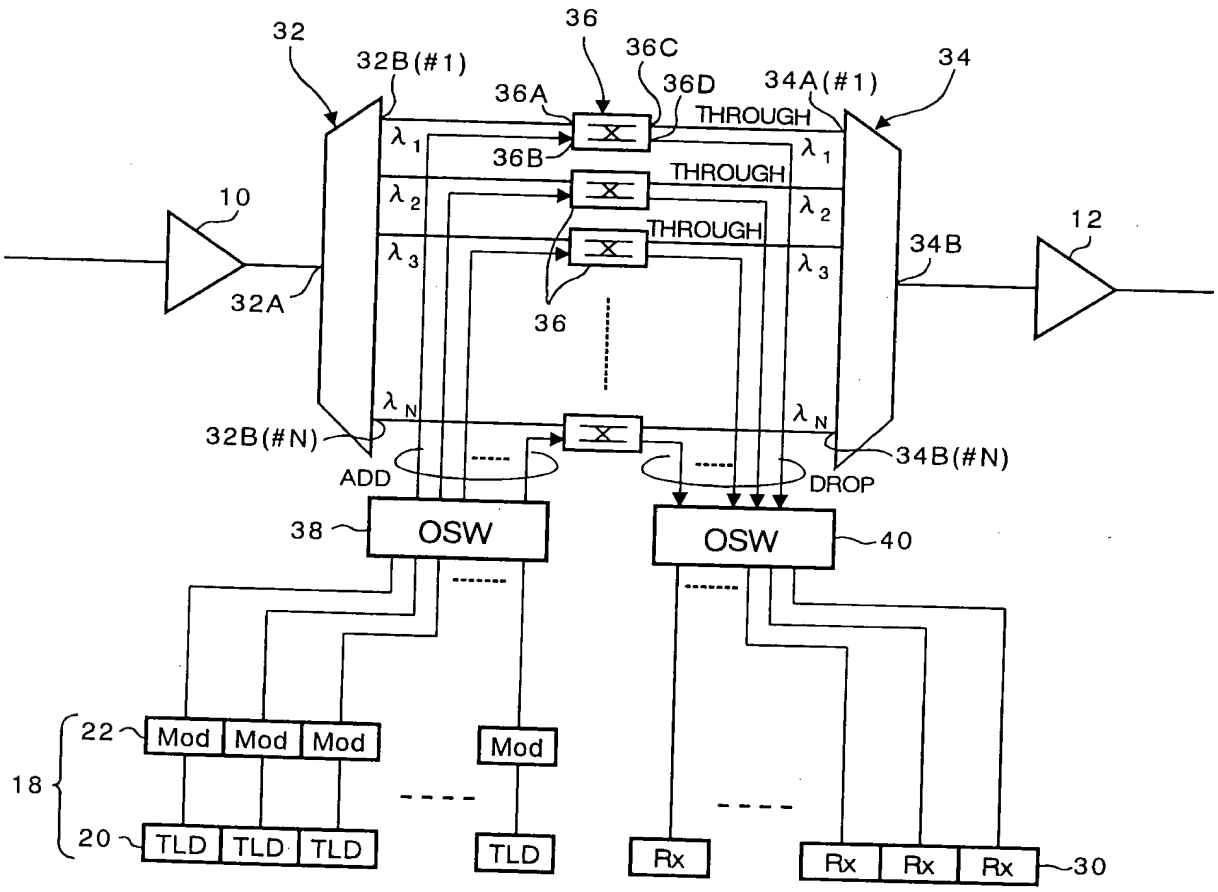


FIG. 13


32
32B(#1)
36
36C
36D
34A(#1)
34
36A
THROUGH
λ_1
36B
THROUGH
λ_2
THROUGH
λ_3
10
12
34B
32A
36
λ_N
32B(#N)
34B(#N)
ADD
DROP
38
OSW
OSW
40
22
Mod
Mod
Mod
Mod
18
20
TLD
TLD
TLD
TLD
Rx
Rx
Rx
Rx
30

Tohzo Sohgyo

FIG. 14

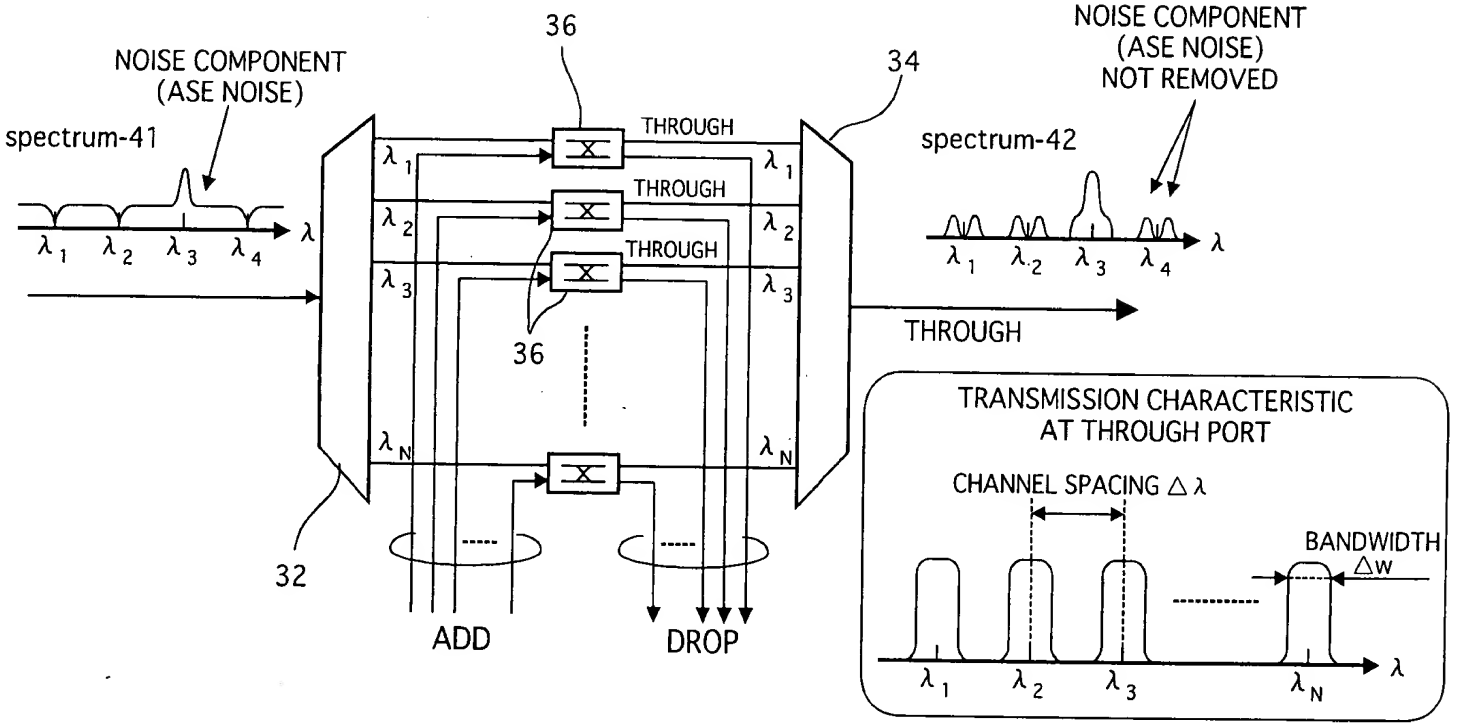
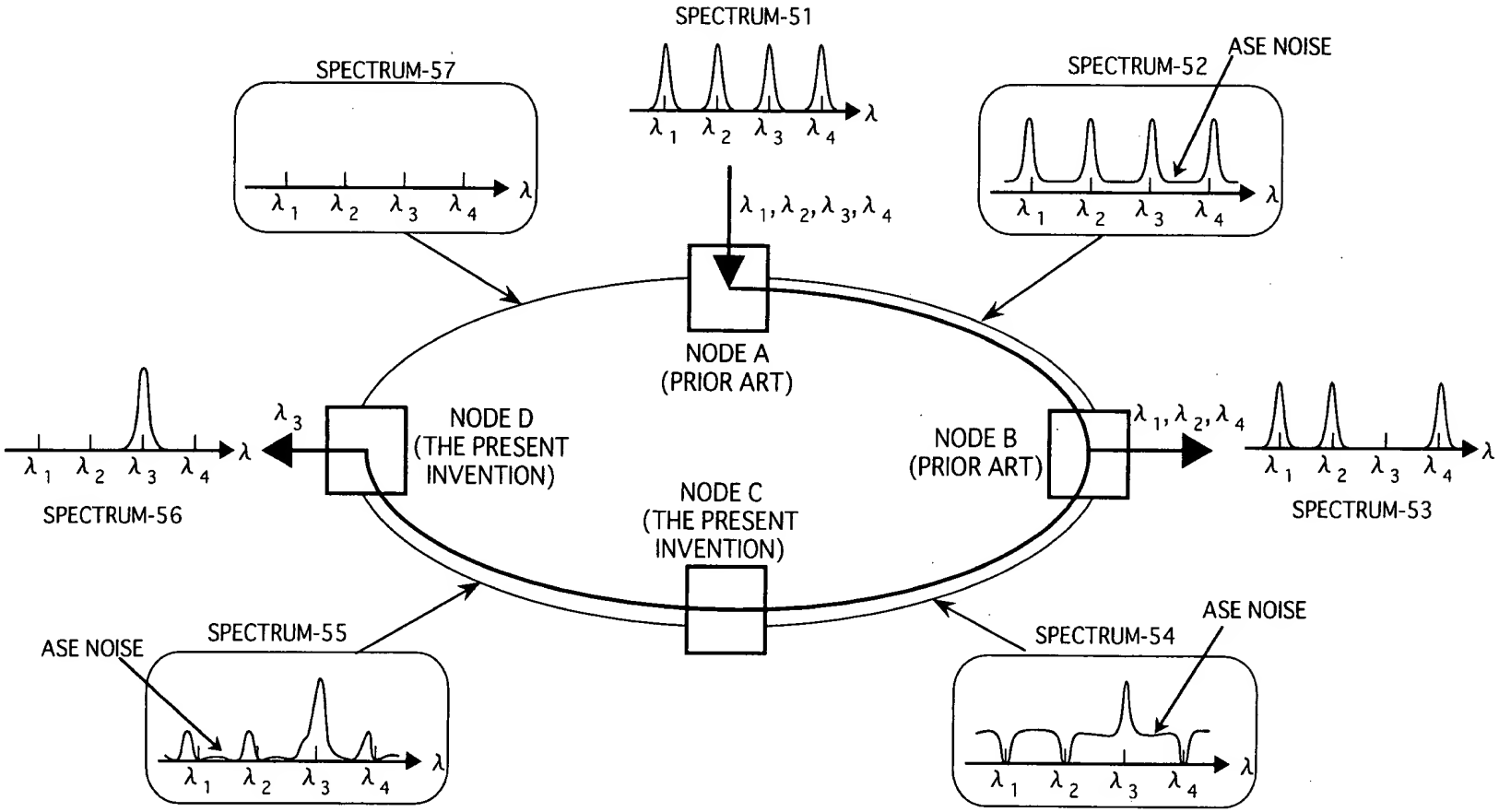


FIG. 15


SPECTRUM-51
SPECTRUM-57
SPECTRUM-52
ASE NOISE
λ1 λ2 λ3 λ4 λ
λ1,λ2,λ3,λ4
NODE A
(PRIOR ART)
NODE D
(THE PRESENT
INVENTION)
λ3
NODE B
(PRIOR ART)
λ1,λ2,λ4
SPECTRUM-56
SPECTRUM-53
NODE C
(THE PRESENT
INVENTION)
ASE NOISE
SPECTRUM-55
SPECTRUM-54
ASE NOISE

TOH2607 SOH9660

FIG. 16

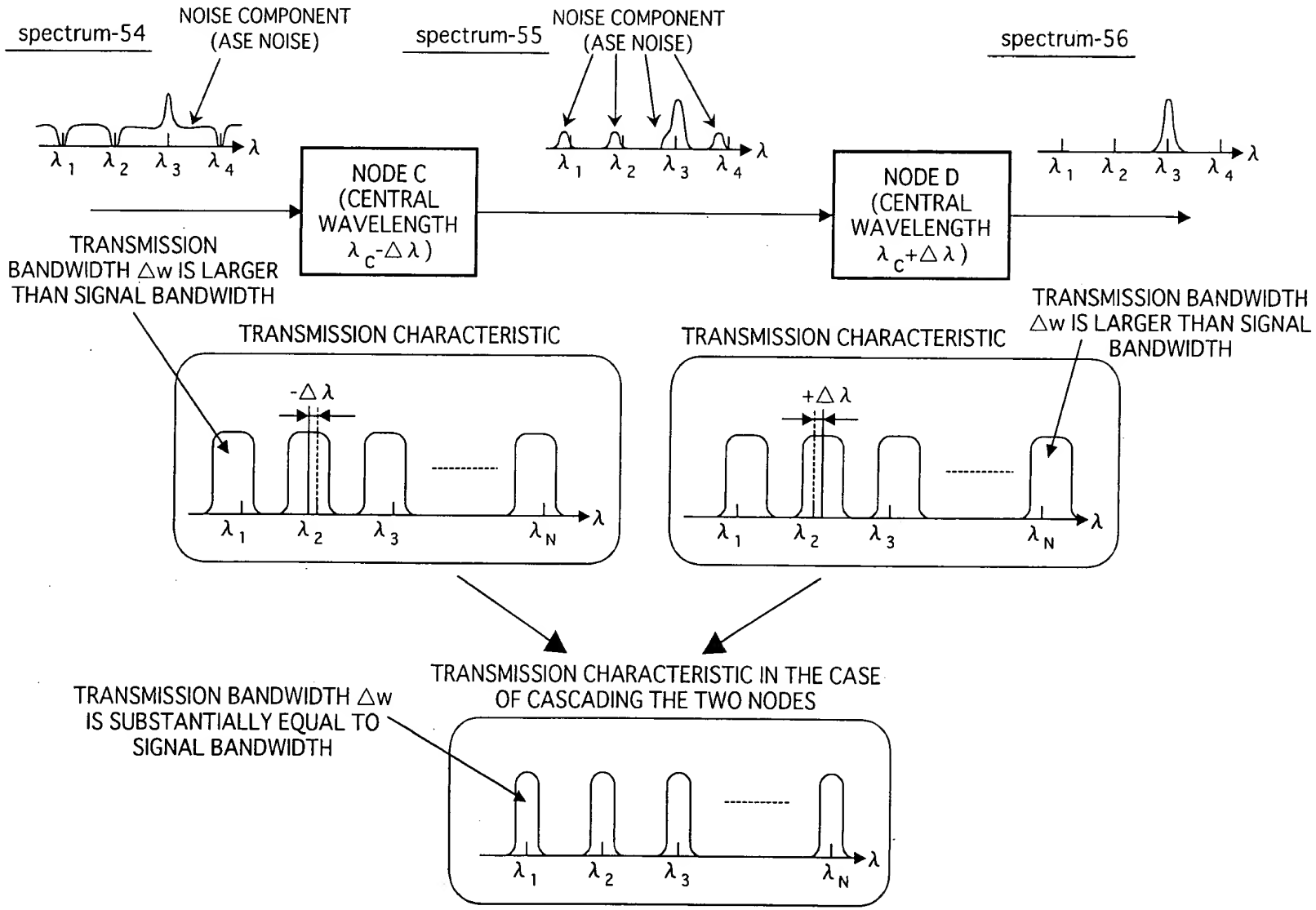


FIG. 17

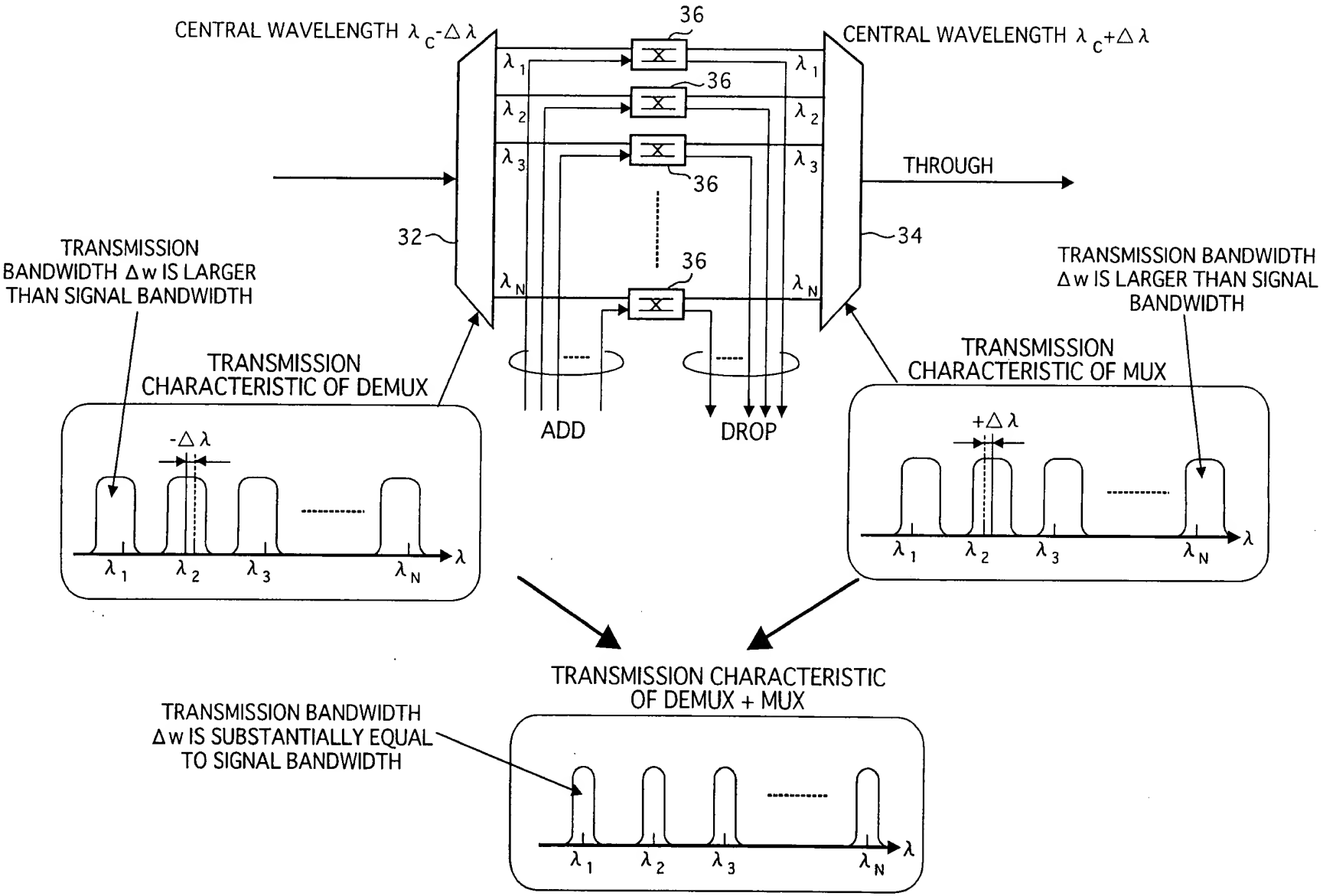

CENTRAL WAVELENGTH λc-Δλ
CENTRAL WAVELENGTH λc+Δλ
36
36
36
36
λ1
λ2
λ3
λN
THROUGH
32
34
ADD
DROP
TRANSMISSION BANDWIDTH Δw IS LARGER THAN SIGNAL BANDWIDTH
TRANSMISSION CHARACTERISTIC OF DEMUX
-Δλ
TRANSMISSION BANDWIDTH Δw IS LARGER THAN SIGNAL BANDWIDTH
TRANSMISSION CHARACTERISTIC OF MUX
+Δλ
TRANSMISSION CHARACTERISTIC OF DEMUX + MUX
TRANSMISSION BANDWIDTH Δw IS SUBSTANTIALLY EQUAL TO SIGNAL BANDWIDTH
λ

FIG. 18

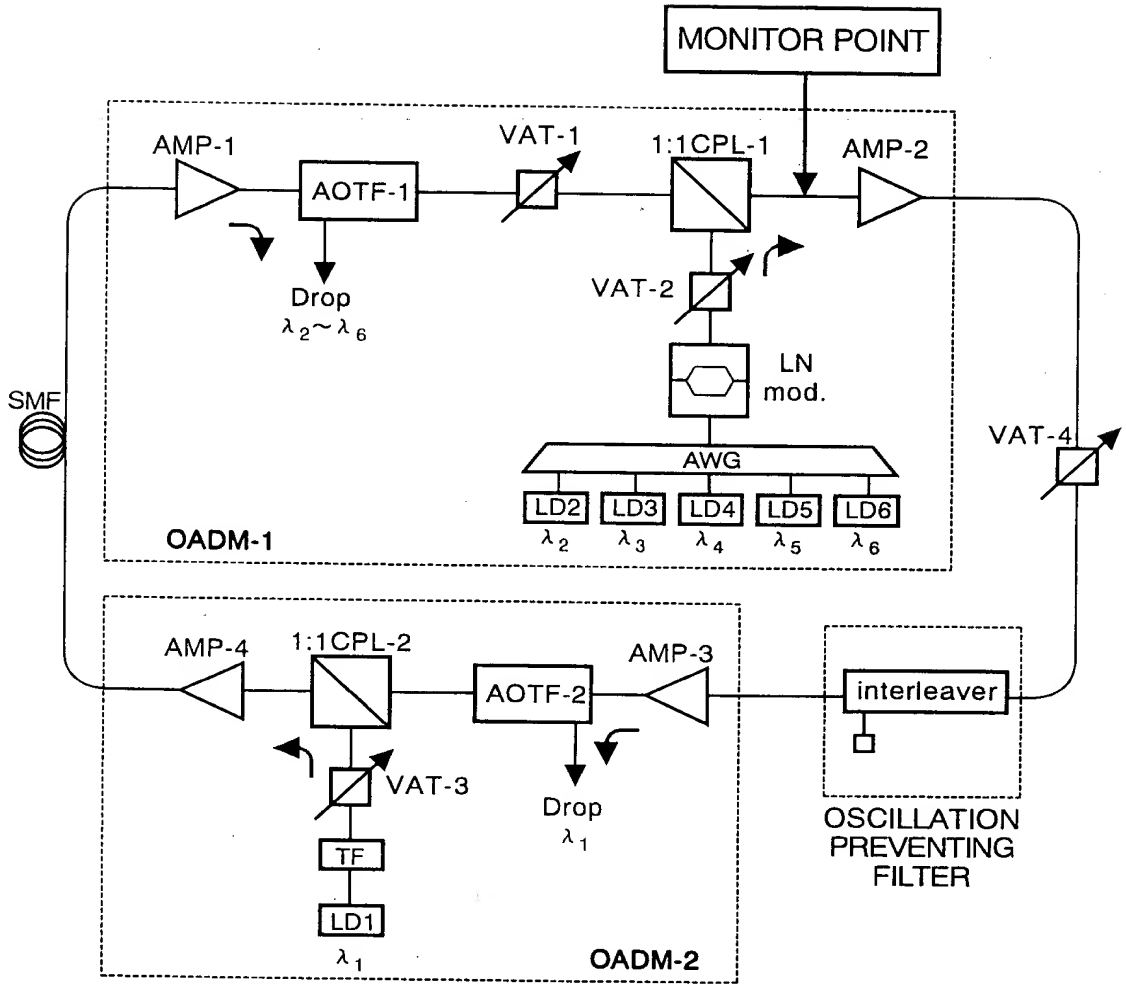
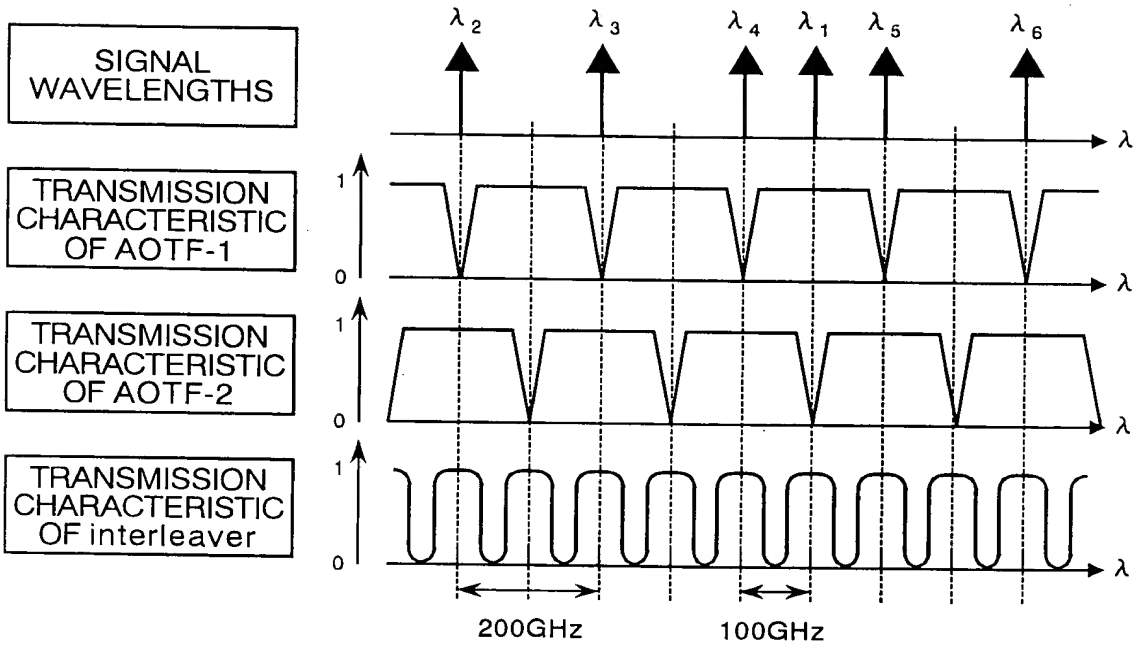
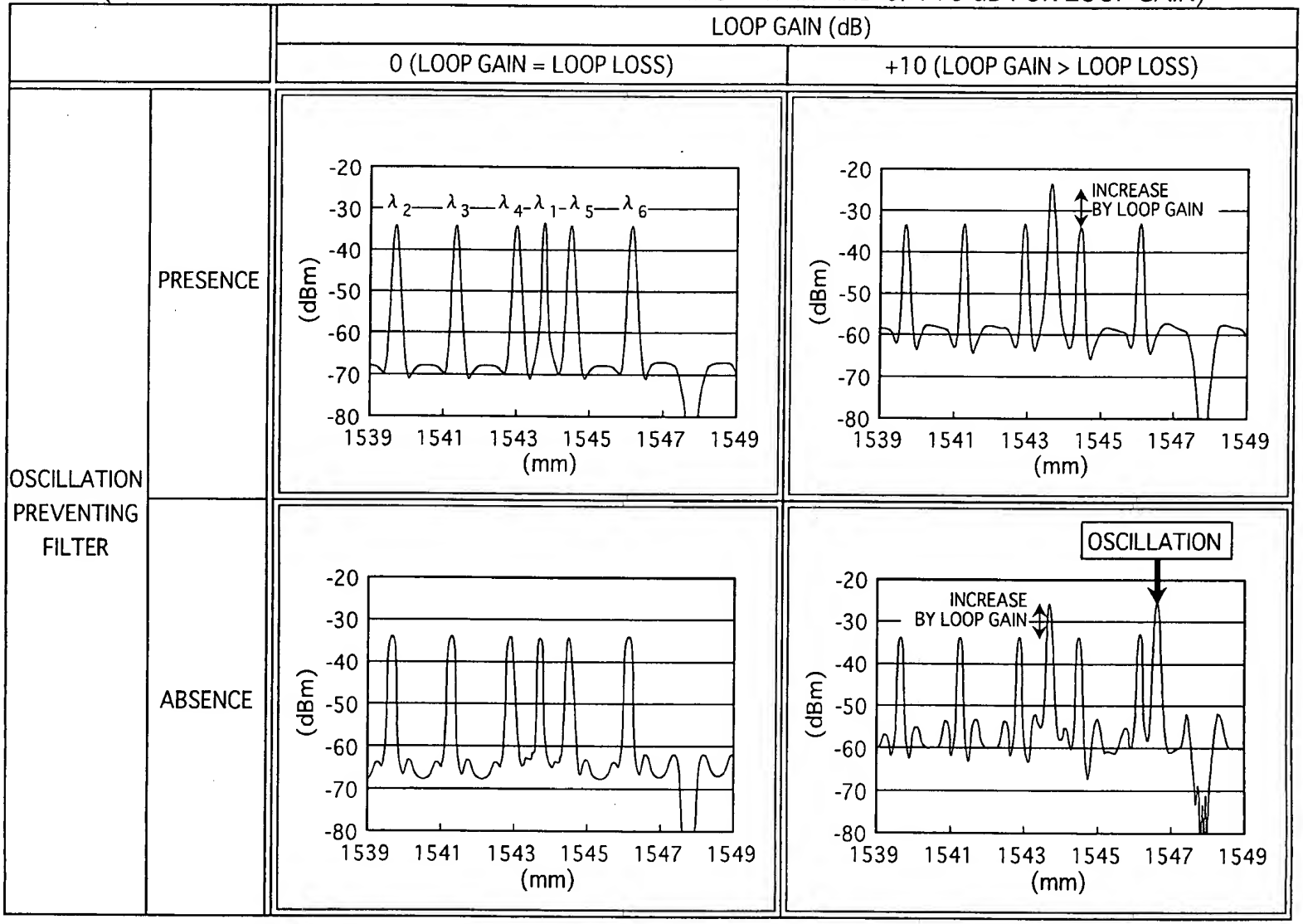

MONITOR POINT
AMP-1
AOTF-1
VAT-1
1:1CPL-1
AMP-2
Drop
λ_2~λ_6
VAT-2
LN
mod.
SMF
VAT-4
AWG
LD2
LD3
LD4
LD5
LD6
λ_2
λ_3
λ_4
λ_5
λ_6
OADM-1
AMP-4
1:1CPL-2
AOTF-2
AMP-3
interleaver
VAT-3
Drop
λ_1
TF
LD1
λ_1
OADM-2
OSCILLATION
PREVENTING
FILTER

FIG. 19


SIGNAL WAVELENGTHS
TRANSMISSION CHARACTERISTIC OF AOTF-1
TRANSMISSION CHARACTERISTIC OF AOTF-2
TRANSMISSION CHARACTERISTIC OF interleaver
λ2
λ3
λ4
λ1
λ5
λ6
λ
1
0
200GHz
100GHz

F I G. 2 0

OPTICAL SPECTRA UNDER DIFFERENT CONDITIONS
(PRESENCE/ABSENCE OF OSCILLATION PREVENTING FILTER AND 0/+10 dB FOR LOOP GAIN)